

2012-13

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY
(COURSE STRUCTURE FOR AUTONOMOUS SCHEME)

I Year M. Tech. (Machine Design) M.E.

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MEMD2T4 - EXPERIMENTAL STRESS ANALYSIS

Unit – I

Elementary Elasticity:

Introduction: Theory of elasticity, plane stress and plane strain conditions, Compatibility conditions, problems using plane stress and plane strain conditions, three dimensional stress strain relations.

Unit – II

Strain Measurement Methods: Various types of strain gauges, Electrical Resistance strain gauges, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor Semiconductor strain gauges, Temperature compensation, strain gauge circuits,

Analysis of Strain Gage Data: Three Element Rectangular Rosette, Delta Rosette, strain gauge rosette.

Unit-III

Recording Instruments: Introduction, static recording and data logging, dynamic recording at very low frequencies, dynamic recording at intermediate frequencies, dynamic recording at high frequencies, dynamic recording at very high frequencies.

Unit – IV

Brittle coatings: Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

Unit – V

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

Unit – VI

Photo elasticity: – Introduction Polariscopes – Plane and circularly polarized light, Bright and dark field setups, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Materials for Two-Dimensional Photo elasticity.

Unit-VII

Three dimensional Photo elasticity: Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, Stress Optic Law, effective stresses, the shear difference method in three dimensions, applications of the Frozen-stress method, the scattered light method.

Unit-VIII

Birefringent Coatings: Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation method Undercoating.

Text books:

1. Experimental stress analysis by Dally and Riley, Mc Graw-Hill International Student Edition, McGraw-Hill Book Company.
2. Experimental stress analysis by Dr. Sadhu Singh, Khanna Publishers
3. Theory of Elasticity by Timoshenke and Goodier Jr.

References:

1. A treatise on Mathematical theory of Elasticity by LOVE .A.H.
2. Photo Elasticity by Frocht.

